INTEGRATED AUTONOMOUS VEHICLES

PERCEPTION, ACTION AND LEARNING IN MOBILE ROBOTS

The Navy needs autonomous robotic systems that can be deployed in remote and hazardous environments, and that can contribute toward the goal of reducing personnel requirements. Navy applications of autonomous systems include shipboard firefighting, hazardous material handling, surveillance, salvage, and undersea equipment maintenance. This project contributes toward the design of future autonomous systems by extending recent results in the areas of machine perception, behavior-based control architectures, task planning, adjustable autonomy, human-computer interactions, and machine learning, with a focus of innovative designs for integrating these functional capabilities.

Long-term goals include answers to fundamental questions such as: Can a robotic system learn how much perceptual detail is required for particular behaviors? Can it learn to adapt to unexpected changes (e.g., malfunctions) in its sensor/motor capacities? How can humans more naturally interact with robots in mixed-initiative systems?

Most recent research in intelligent mobile robots addresses relatively simple tasks such as following walls or pushing boxes, behaviors that do not require sophisticated interactions among perception, planning, control and learning. In contrast, we are particularly interested in more challenging classes of problems involving multiple robots and humans in competitive or cooperative tasks, such as:

- Locating, tracking, evading and targeting another mobile robot in a cluttered environment;
- Locating and retrieving hidden items, either in competition or in cooperation with other robots; and
- Urban warfare, search and rescue, and other tasks requiring adjustable autonomy and close interaction with humans.

Results are tested in the context of tasks performed by real robots in NCARAI's robot lab.

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